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BRIEFER ARTICLES.

NOTES ON NORTH AMERICAN WILLOWS. I.

(WITH PLATES XII AND XIII)

Salix Gooddingi, n. sp.—A shrub or small tree 2–3^m high: twigs straight, slender, yellowish, only slightly shining, glabrous or finely puberulent just above the axils of the short fertile branches (very young shoots probably pubescent): leaves on fertile twigs lanceolate or narrowly elliptic-lanceolate, sharply acute or sometimes abruptly short-acuminate at the apex, acute at the base, 2.5–4.5^{cm} long, 6–10^{mm} wide (probably considerably larger on sterile shoots), entire or sparsely to closely glandular-serrate, frequently somewhat falcate; usually glabrous, or puberulent to finely silky-pubescent when young, especially near the base, becoming entirely glabrous with age, dull green on both sides, scarcely paler beneath; midrib distinct, yellowish, nerves not prominent; petioles pubescent, 1–3^{mm} long; stipules none: aments appearing with the leaves, solitary, terminating short lateral leafy pubescent branches which are 1–2.5^{cm} long, and bear 3–6 leaves; pistillate abundantly produced, slender, rather lax in fruit, 3–5^{cm} long, the rachis densely gray-pubescent: capsules short ovate-conic, 3–4^{mm} long, densely gray-tomentose, long pedicelled; pedicels densely gray-tomentose, 1.5–3^{mm} long; scales yellow, linear-ob lanceolate, obtuse, 0.5^{mm} wide, 2.5–3^{mm} long, white-tomentose on both sides; style none; stigmas divided, short, thick, reddish-brown.—*Plate XII*, *figs. 1, 2*.

S. Gooddingi belongs to the section LONGIFOLIEAE and is probably most nearly related to *S. Bolanderiana* Rowlee, from the Yosemite Valley, California. It is easily separated from all other species by the long pedicels, nearly equalling the capsule in length. The foliage bears a superficial resemblance to that of *S. nigra* Marsh.

The type was collected by LESLIE N. GOODDING, of the University of Wyoming, no. 689, Flora of Nevada; ditch banks, Muddy Creek, May 2, 1902. Muddy Creek is a tributary of the Virgin River, which flows into the Colorado in Lincoln County, in extreme southeastern Nevada. The specimen consists of pistillate shoots bearing numerous nearly mature aments. No other material has been seen. The species is named in honor of the collector, who has furnished the following notes on the plant and the locality in which it was found:

"Collected along a ditch where it grew quite profusely, 8–10 feet high. It grows in patches or clumps, much the same as *S. exigua* and *S. fluviatilis*, only with a tendency to branch more from central axes. It was quite abundant where collected, appearing along the ditch for some distance, but I believe its distribution quite local,

as it was collected at no other place. It doubtless is common along the Muddy. The region of the Muddy is a very barren desert, scarcely anything growing except along the streams or ditches. The water and the soil are quite salty and there are low hills of salt which border along the Muddy and the Virgin. The willow, however, seeks the stream banks and ditches, the little marshy places being too alkaline."

Salix Tweedyi (Bebb) n. comb. *S. Barrattiana Tweedyi* Bebb, Contrib. U. S. Nat. Herb. 3:572. 1896.—A shrub, with short stout divaricate branches; bark on the older twigs gray, somewhat shining, on younger twigs chestnut to deep reddish-brown, usually quite glabrous except the twigs of the season, which are commonly densely pubescent with spreading gray hairs: buds large, 6–10^{mm} long, chestnut, thinly pubescent with long hairs, at length glabrate: leaves elliptical and acute at both ends, to oval, acute to somewhat obtuse at the apex, acute to rounded at the base, or subcordate in mature foliage, occasionally obovate-oval, rounded at the apex, especially when young, 5–7^{cm} long, 2.5–4^{cm} wide; glabrous on both sides or the young leaves sparsely pubescent above with long gray hairs, green above, paler but not glaucous beneath; margin finely and closely glandular-denticulate or serrate, the yellowish glands projecting at right angles to the apparently entire margins of the young leaves, in mature leaves the glands on the points of irregular, spinulose teeth, perpendicular or sometimes pointing toward the apex of the leaf; petioles 8–15^{mm} long, frequently tomentose; stipules large, broadly reniform, somewhat clasping, 5–14^{mm} long, glandular spinulose-denticulate: pistillate aments precocious, sessile, stout, lateral and terminal, spreading, often curved, 4–6^{cm} long, 1.5–1.8^{cm} wide in fruit: capsules green and glabrous, or sometimes finely pubescent near the apex, ovate-conical, pedicellate, 7–8^{mm} long when mature; pedicel 1^{mm} long, smooth; style 1.5–2.5^{mm} long, green, stigmas divided, about 0.5^{mm} long; scale obovate, acute or obtusish, 2–2.5^{mm} long, black, clothed with long, straight, white hairs; gland about 1^{mm} long.—*Plate XII, figs. 3–7.*

WYOMING: head of Big Goose Creek, Big Horn Mountains, nos. 11 (the type) and 12, *Frank Tweedy*, July 15–24, 1893; "along streams in Teton Basin, July. With ovaries nearly smooth! Professor *Porter*." J. M. Coulter, 1872.

This last specimen is listed by COULTER¹ under the name of *S. Barrattiana*. In the U. S. National Herbarium the Hayden Survey specimen is ticketed "Trail R. Mts., Idaho Terr." Trail Creek, along which the party worked, is, however, in southwestern Montana, not far north of the Yellowstone Park. The sheet carries pistillate aments and both young and mature foliage. Though collected twenty-one years earlier than the type collection, it is not mentioned by BEBB, and was probably unknown to him.

The variety was named and described by BEBB in an article by J. N. ROSE,

¹ Hayden, Ann. Rept. U. S. Geol. Surv. Terr. 6:781.

based on a small collection of plants made by FRANK TWEEDY, of the U. S. Geological Survey. His collections were made in the Big Horn Mountains, "between longitude 107° and $107^{\circ} 30'$ and latitude $44^{\circ} 30'$ and $44^{\circ} 40'$, chiefly on the headwaters of the east and west forks of Big Goose Creek and on the high divide between these streams and Shell Creek."

The original description and the accompanying data are as follows:

"Leaves at first thinly overspread on the upper surface with floccose hairs, soon smooth and green both sides; capsules glabrous. In bogs and along mountain streams, altitude 2,460 to 3,080m (8,000 to 10,000^{ft}). Head of Big Goose Creek, Big Horn Mountains, July 15 (nos. 11 and 12)."

BEBB, after noting the original and few subsequent collections of the rare *Salix Barrattiana* and remarking on its silky leaves and capsules, continues:

"That there should be more or less variation in this vesture was to be expected from what is known of the two most nearly allied species. *S. Hookeriana* was first described as having 'very smooth' capsules, but subsequent observations have shown that they are more frequently tomentose, and a like variation, though in less degree, prevails in the case of *S. Richardsoni*; but in neither is this variation so pronounced as to lessen the surprise with which we find the one species of the group heretofore most conspicuous for its silky vesture, appearing, as in Mr. TWEEDY'S specimens, so markedly glabrate. The leaves, and in fact the aments as well, bear a very close and deceptive resemblance to some forms of *S. Barclayi*; but the aments are closely sessile, terminal as well as lateral, the styles longer and the stigmas bifid; the leaves alone could scarcely be distinguished one from the other."

A study of the type material and of later collections leaves no doubt that this willow is specifically distinct from *S. Barrattiana*. Not only do the nearly glabrous leaves and the glabrous capsules serve to distinguish it, but the leaf margin thickly set with conspicuous glands is a marked character.

The varietal name proposed by BEBB was "*denudata*," but as this was pre-occupied by *S. commutata denudata* Bebb (1888) ROSE substituted the name "*Tweedyi*" and credited it to BEBB, whose name appears in the text as the author. COCKERELL has since contended² that ROSE and not BEBB must be considered the author of the variety. This view, however, cannot be accepted.

***Salix Wolfii Idahoensis*, n. var.**—Leaves usually densely silky-villous with shining hairs, giving a decided luster to the surface, scarcely blackening in drying: capsules 3–4^{mm} long, thinly but permanently silky pubescent; style about 1^{mm} long.

WYOMING: Mammoth Hot Springs, Yellowstone National Park, no. 5655, *Aven* and *Elias Nelson*, July 3, 1899; Swan Lake Valley, Yellowstone National Park, alt. 7,300^{ft} (2250^m), *F. H. Knowlton*, July 9, 1888.

MONTANA: Madison Cañon, *J. M. Coulter*, Hayden Survey, 1872. The specimen so labelled in the U. S. National Herbarium (accession no. 253,723) bears on the label, "Madison Cañon, Idaho Ter.," which must certainly be an error, since the

² BOT. GAZETTE 22: 268. 1896.

Madison Cañon explored by the Hayden Survey in 1872 is in Montana, not far from the boundary of the Yellowstone Park. This specimen was probably listed under the name of *Salix glauca* L., which is credited by COULTER in his list³ to the "Upper cañon of the Madison." *S. Wolfii* is, of course, not mentioned, because it was not published until six years later, in 1878.

IDAHO: Forks of Wood River, alt. 6000^{ft} (1800^m), no. 3399 (type), *L. F. Henderson*, July 25, 1895.

OREGON: Banks of Wallowa River, mouth of Hurricane Creek, no. 2400, *W. C. Cusick*, June 11, 1900.

The relationships of this little willow are all with *S. Wolfii* Bebb, from the typical form of which it differs mainly in the silky-pubescent capsule and the rather more silky leaves. The different specimens show considerable variation in the amount of pubescence on the capsules. In general, the specimens from the more northwestern localities show the denser pubescence, both on leaves and capsules. In some cases they tend toward a glabrate condition in age. In *S. Wolfii* the capsules are glabrous even when young. This variety is found from the Yellowstone Park northwestward across Montana and Idaho to eastern Oregon. The species is found from central Colorado to Montana and Idaho.

Salix Nelsoni, n. sp.—A shrub, 1.2–3^m high, freely branching, very leafy; twigs shining, the older gray with a reddish tinge, the younger bright chestnut or darker, and often drying dark: buds large, smooth, chestnut, 7–9^{mm} long, beaked: leaves petioled, petioles 3–7^{mm} long, smooth; stipules none; blades oblanceolate or rarely narrowly lanceolate, acute at both ends, cuneate at the base, 8–15^{mm} wide, 3–5.5^{cm} long, entire (except as noted below), the margin somewhat involute, especially toward the base; glabrous, or thinly silky villous when young, green and very shining above, pale and somewhat glaucous below; primary veins prominent, usually elevated and rather greenish-yellow on the upper surface, prominently reticulate below by the elevation of both primaries and secondaries;⁴ apical and subapical leaves on sterile shoots narrowly elliptical, the margin shallowly glandular crenate-serrate: pistillate aments sessile with sometimes a few small foliaceous bracts at the base, spreading, slender and cylindrical when young, very much thickened in fruit, 1.5–3^{cm} long: capsules silky pubescent, sessile, 5–6^{mm} long; styles entire or rarely bifid, 0.3–0.5^{mm} long; stigmas smooth, 0.7–1.0^{mm} long, dark; scales dark, ovate, acute, clothed on both sides with long white hairs: staminate aments not seen.—*Plate XIII*, figs. 8–11.

COLORADO: Little Fountain Creek (south of Pike's Peak), alt. 9200^{ft}, no. 12, *J. C. Blumer*, September 5, 1903; Mt. Lincoln, Park Co., alt. 12,000^{ft}, *J. M. Coulter*,

³ Ann. Rept. U. S. Geol. Surv. Terr. 6:782. 1873.

⁴ In the type the primaries and sometimes also the secondaries on the upper surface are very broad and deep green in color, giving a strikingly beautiful effect, which is not so evident in other specimens.

July 9, 1873; Beaver Creek, Larimer Co., roadsides in pine woods, no. 1440, *L. N. Goodding*, July 4, 1903.

WYOMING: Centennial Valley, no. 1754, *Aven Nelson*, August 18, 1895; Centennial, Albany Co., bogs, no. 8822, *Aven Nelson*, August 7, 1902; Laramie Peak, Albany Co., along the creek, in clumps, 4-10^{ft} high, no. 7580 (type), *Aven Nelson*, July 13, 1900; head of Big Goose Creek, Big Horn Mountains, no. 47, *Frank Tweedy*, July 15-24, 1893.

ALBERTA: Banff, low ground, side of road to Devil's Head Lake, alt. 4500^{ft}, no. 2253, *W. C. McCalla*, June 8 and August, 1899.

This beautiful willow is found at high altitudes in the mountains of Colorado and northward. It is most closely related to *S. chlorophylla* Anderss. and the pistillate aments closely resemble those of that species. It is readily distinguished by the oblanceolate leaves which, when mature, are prominently nerved above and reticulated beneath. Authentic staminate material has not been seen.

I take pleasure in dedicating this species to Professor AVEN NELSON, of the Rocky Mountain Herbarium, who has made available so much valuable material in this difficult genus.—CARLETON R. BALL, *U. S. Department of Agriculture, Washington, D. C.*

EXPLANATION OF PLATES XII AND XIII.

PLATE XII.

FIGS. 1 and 2. *S. Gooddingi* Ball; *fig. 1*, fruiting branch, natural size; *fig. 2*, capsule and scale. $\times 10$.

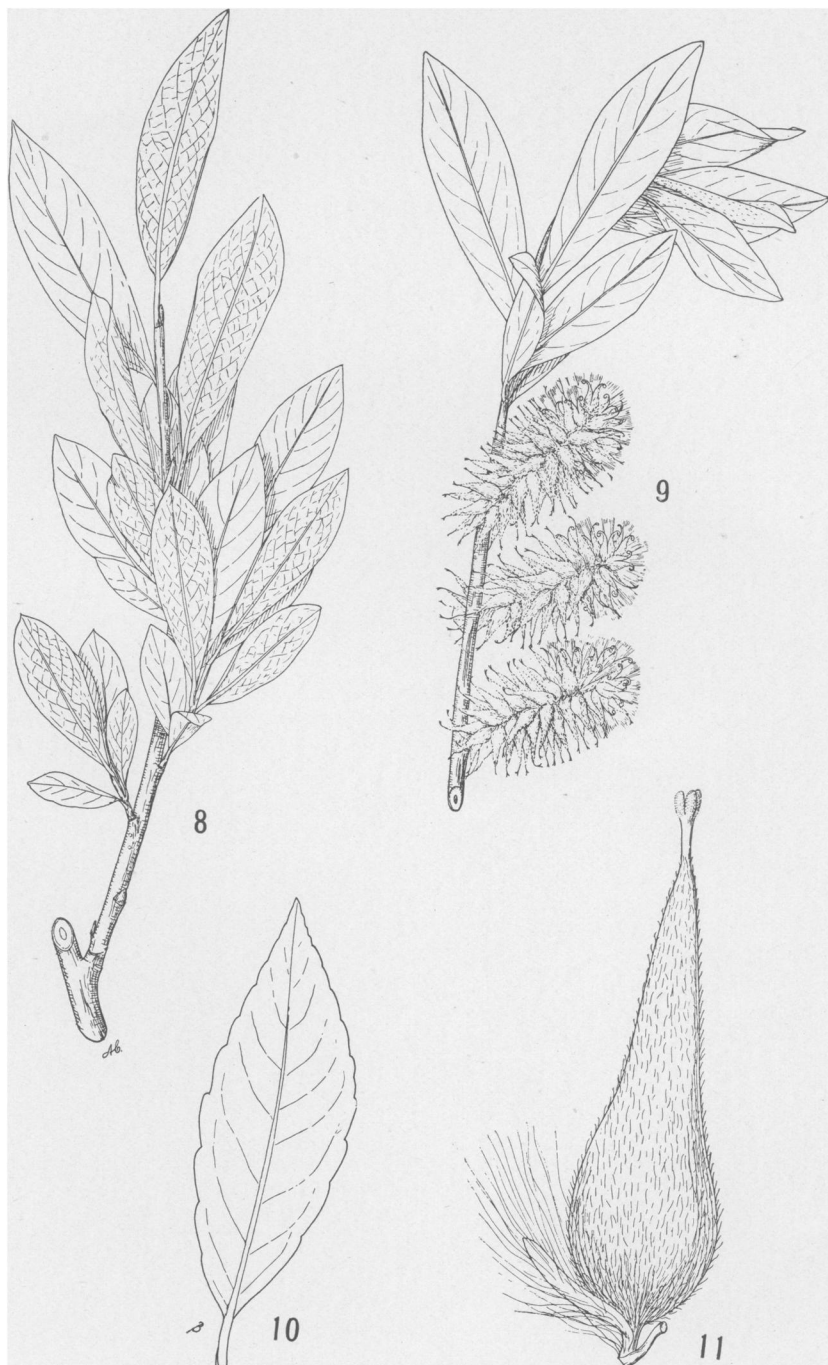
FIGS. 3-7. *S. Tweedyi* (Bebb) Ball. *Fig. 3*, sterile twig; *fig. 4*, pistillate ament; *fig. 5*, mature leaf showing stipule and bud; *fig. 6*, capsule ($\times 10$); *fig. 7*, outline of margin of young leaf showing glands. $\times 10$.

PLATE XIII.

FIGS. 8-11. *S. Nelsoni* Ball; *Fig. 8*, Sterile twig, from type; *fig. 9*, fruiting branch; *fig. 10*, elliptical apical leaf; *fig. 11*, capsule, $\times 10$.



BALL on SALIX



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